

POTENTIAL USE OF MICROCOMPUTERS
IN FARM MANAGEMENT

by

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Chapter 1

The Project

1-1 Introduction

The newest piece of farm equipment for the 1980's may not be the traditional bigger and more sophisticated tractor but a microcomputer. Computers have come of age as farmers realize the speed and efficiency with which computers can manipulate data.

Several universities with agricultural programs are in the initial stages of developing software for home (micro) computers.[1] In addition a few commercial firms have ventured into the production of farm oriented programs. Unfortunately, the availability of hardware far exceeds that of the software (programs) which will make home computers useful to farmers.

Because of the lack of software to perform functions required by farmers, a survey of Kansas farmers was proposed to determine in order of importance those functions they felt a need for a microcomputer to perform on their farm. This report will define the objectives of the survey, develop a profile of the potential farm microcomputer user, and comment on the feasibility of implementing and using the functions desired by farmers.

1-2 The Survey

1-2.1 Objectives

The objectives of the survey were as follows :

- 1) Determine the computing tools farmers have used, their rating of those tools, and the functions those tools performed.
- 2) Establish the factors farmers regard as most important when considering the use of a computer.
- 3) Determine what plans, if any, farmers have for purchasing a home computer.
- 4) Define those functions farmers want a home computer to provide.

1-2.2 Use of Computing Tools by Farmers

A variety of computing tools have been developed for farm management. Several universities have produced software for programmable calculators, as well as home computers. The Extension Service at Kansas State University (KSU) offers a variety of computer programs via the Agnet and KCAT systems. These farm management programs can be accessed by farmers across the state through remote terminals located at County Extension Offices.[2]

A few of my farm acquaintances have their record keeping performed by a commercial computing service. Many of these services are operated by accounting firms or banks.

In order to satisfy the first objective of the survey, computing tools were grouped into the following categories.

- 1) Programmable calculators
- 2) Home microcomputers
- 3) Extension (university) computing services
- 4) Commercial computing services

Formulating a question that would determine the farmer's satisfaction with these tools was difficult. I visited with some Extension Economists at KSU who have been involved with farm computing. They thought it would be informative to know how well the tools lived up to the claims made about their performance. Some farmers felt they had been sold a 'bill of goods' when the programmable calculator or home computer wasn't as easy to operate or program as the salesperson said it would be.

In my experience with these computing tools, user documentation is not always adequate or understandable for the non-technical person. Procedures which seem to be guided by common sense, from a programmers view, appear to be confusing to the farmer. Programs are not always sufficiently robust to catch the user's mistakes. A simple session at a computer terminal or with a \$150.00 programmable calculator can become an extremely frustrating experience if the software is not designed to detect errors and provide assistance for corrective action. Reliability of the software and hardware would contribute to the users degree of satisfaction. Farmers are too familiar with the high cost of down-time.

Confidence in the results obtained from these computing tools is important. Lack of trust regarding computers is no new phenomenon. A farmer's realistic confidence level in the results of computer output will have a direct relationship to the incorporation of a computer in the management of a farm. The desire to use the tool again is an indication of the farmer's acceptance of, and satisfaction with these tools.

With comments from the Agricultural Economists at KSU and based on my own experience a set of five criteria was developed with which to measure user satisfaction. The survey respondents could then rate them on a numerical scale ranging in interpretation from low to high. These factors listed below would measure a farmer's satisfaction with a tool already used.

- 1) Confidence in results
- 2) Degree to which its performance matched your expectations
- 3) Understandability of procedures and instructions
- 4) Desire to use it again
- 5) Reliability (freedom from program or hardware errors)

In addition to rating the tools they had used, the farmers were also asked to check which of the following functions were performed.

- 1) Financial record keeping
- 2) Production record keeping
- 3) Ration formulation
- 4) Break even analysis
- 5) Market analysis
- 6) Estate planning
- 7) Other (specify)

1-2.3 Use Factors

Four factors were selected for the respondents to rank in order of importance when considering the use or purchase of a computer.

- 1) Privacy of data
- 2) Cost
- 3) Availability of software
- 4) Simplicity of use

The farmers were encouraged to comment on other factors they considered important.

1-2.4 Purchase Plans

To meet this objective the farmers were asked if they considered purchasing a home computer. If affirmative, a time estimation was requested.

1-2.5 Functions Desired by Farmers

The last step in developing the survey was to list a variety of functions that might be implemented on a home computer. Programs developed at Oklahoma State University, Kansas State University and a few commercial firms' software catalogs were consulted to develop the list.[1-5] In enumerating the following functions an attempt was made to cover the financial, production and marketing segments of a farm as broadly as possible without producing too voluminous a list. This list included:

- 1) Financial record keeping
- 2) Depreciation scheduling
- 3) Balance sheet, income, cash flow statements
- 4) Payroll
- 5) Income tax preparation
- 6) Budget preparation
- 7) Analysis of projected budgets vs. actual expenditures
- 8) Crop production records (by fields)
- 9) Livestock production records
- 10) Break even analysis of individual farm enterprises
- 11) Least cost ration formulation
- 12) Nutrient analysis of rations (estimated protein, energy of a given ration)
- 13) Calculation of chemical and fertilizer application rates
- 14) Planting rates
- 15) Maintaining records of commodity prices
- 16) Calculation of grain storage costs
- 17) Harvest records (calculation of net lbs., bu., moisture discount, rent share, etc.)
- 18) Calculation of various weights and measures; conversion to metric
- 19) Periodic summary reports of production

The respondents were asked to check those functions they would like to have. They were also encouraged to comment on additional desirable functions.

1-3 Farmer Profile

To develop a profile of the farmer it was necessary to determine size and scope of the farm, types of crops and livestock produced, number of acres managed, percent of the farm tillable and irrigated, and educational background.

Initially I wanted to determine the farmers' financial status. Gross income would be a good measure of farm size. Given the farmers' independent nature it was decided that asking for confidential information would diminish the return rate of the survey. Thus any reference to the farmers' financial status was avoided.

1-4 The Questionnaire

After defining the information desired from the survey, the questionnaire was developed. The objective was to produce a short, understandable form limited to the front and back sides of one page. Words belonging to the 'computerese' language were avoided.

The survey was sent in May and knowing the busy spring schedule of farmers, the questions were designed so they could be answered by checking categories or by numerical ranking. A blank sheet was included for additional comments. To avoid an institutional appearance the questionnaire was produced on goldenrod colored paper.

Obtaining a mailing list of Kansas farmers was difficult. I approached the State ASCS Office (Agricultural Stabilization and Conservation Service). They have the addresses of every agricultural land owner and farmer in the state. Because of the Federal Privacy Act

only a list of names, but no addresses, was available. Petitioning Washington may have allowed access to the addresses; this seemed to be an impractical route. The State Extension Service at KSU is under the same restrictions as ASCS and could provide no alternative source of potential respondents. Thus, after much thought it was decided to use three other sources. First a directory of my agricultural fraternity (FarmHouse) was obtained and Kansas farmers on that list were included. The survey results from this group are biased because the participants chosen are all college educated. These farmers are labeled the Fraternity, or FRAT group through out this report.

Second, Art Barnaby, KSU Extension Economist, had constructed a list of farmers interested in micro computers. Some of these individuals already owned a home computer. It was felt their answers and comments would provide a significant amount of experiential information. These participants are labeled the Inquiring, or INQR group through out this report.

Through contacts around the state a third list of farmers was composed. This group is labeled the Random, or RAND group. The three groups are collectively labeled as the TOTL group.

The FRAT group contained ninety two farmers, INQR contained twenty eight farmers, and the RAND group contained twenty six farmers. A total of one hundred forty six questionnaires were mailed on May 26, 1980. The cover letter and a reproduction of the questionnaire appears in Appendix A.

Chapter 2

Analysis of Survey Results

2-1 Initial Observations

Three weeks after mailing the questionnaires, seventy five (51%) of them had been returned. The percentage of respondents from each group is presented in the following table.

Table 2.1 - Survey Response

<u>GROUP</u>	<u>NUMBER</u>	<u>RETURNED</u>	<u>PERCENT</u>
RAND	26	9	34.5
INQR	28	17	60.7
FRAT	92	49	53.3
TOTL	146	75	51.4

SPSS, Statistical Package For the Social Sciences, was used for the statistical analysis.[6] Frequency distributions for each question was tabulated. Means and standard deviations were also calculated when appropriate. The frequency distributions for each group by question and for the TOTL group are given in Appendix B.

While making initial observations of the frequencies a most surprising result appeared. Twelve (16%) of the respondents already owned a home computer. Looking at each group individually, ten of the owners are from Barnaby's INQR list. Two are from the RAND group. None of the FRAT respondents owned a home computer or had ever used one. (Appendix B, tables 7 and 14)

In order to develop a profile of the potential home computer user the respondents were sorted into categories based on their answer to the purchase question. Three new groups were formed: 1) OWNER (already

have one), 2) YES and 3) NO. Four of the seventy five either failed to answer the Purchase question or responded with "I don't know". They were excluded from this analysis.

Frequency distributions, means, and standard deviations were tabulated for the three new groups. The OWNER group was comprised of 12 respondents, the YES group of 38, and the NO group of 21. Some of the participants failed to answer all of the questions. In such cases the new groups may appear slightly smaller than previously defined. The frequency distributions by question for the three new groups are given in Appendix C.

Table 2.2 - Response to Purchase Question

<u>GROUP</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
YES	5-56%	6-35%	27-55%	38-51%
NO	2-22%	-	19-39%	21-28%
OWNER	2-22%	10-59%	-	12-16%
OTHER	-	1-06%	3-06%	4-05%

* NOTE Frequency tables follow the format, AA-XX%, where AA is the absolute frequency and XX% is the column percentage of that class. For example, in Table 2.2, five (56%) of the RAND respondents answered 'yes' to the purchase question. A zero frequency is indicated by the singular ' - '.

2-2 Profile of the Potential User

2-2.1 Background

To develop a profile of the potential user only the YES and NO groups were compared. The OWNER group is so small that any comparison would be less than reliable. Telephone conversations with a few of the owners has provided some interesting information. It will be discussed when appropriate.

My initial hypothesis was that the larger farms would be more likely to utilize a home computer. Those having instruction in computer programming were also targeted as potential users. In addition, it was felt the potential user would be very concerned with the privacy of his information. To test my hypotheses and to develop a user profile the frequencies or means of the two groups were compared. When appropriate the level of significance of a relationship was tested by using the chi-square statistic. SPSS provides a procedure called cross-tabulation for this purpose. The frequencies of a given relationship are displayed in tabular form complete with row and column percentages. The chi square statistic and its level of significance are then calculated. Statisticians look for significance equal to or less than 0.05. At the 0.05 level one could conclude that only five times in one hundred would the given relationship be due to sampling error.[7] A less stringent test could be made at the 0.10 level of significance. Table 2.3 illustrates a SPSS cross-tabulation relating the Purchase response to wheat production.

Table 2.3 : Cross-tab of Purchase by Wheat

PURCHASE	WHEAT		ROW TOTAL
	NOT PRODUCED	PRODUCED	
YES	3 7.9% 100.0%	35 92.1% 62.5%	38 64.4%
NO	0 0.0% 0.0%	21 100.0% 35.5%	21 35.6%
COLUMN TOTAL	3 5.1%	56 94.9%	59 100.0%

Significance = 0.4822

The first number in each box, or cell, is the frequency count. In this example three of the YES respondents do not raise wheat. The second number is the percent of the total row. The last number in each cell gives the percent of the total column. Because the significance level is 0.4822, the hypothesis that a relationship exists between the production of wheat and the farmer's purchase response is rejected.

The survey is divided into the following sections of analysis.

- 1) Size and type of farm
- 2) Educational background of the farmer
- 3) Relative importance of use factors
- 4) Performance rating of computing tools

The profile of the potential user is developed from these sections. Relevant characteristics common to the entire group will be discussed.

2-2.2 Farm Size and Type

The first question of the survey asked farmers to check the commodities produced on their farm. The results appear in Table 2.4. Percentage of farms in each category appear relatively close between groups with the exception of corn, hay, and finish cattle. Cross-tabulating each of these three enterprises with the purchase response only produced significance in the case of corn.

Table 2.4 - Enterprise Frequencies of
the YES and NO Groups

<u>ENTERPRISE</u>	<u>YES</u>	<u>NO</u>
Wheat	35-92%	21-100
Corn	17-45%	3-14%
Milo	30-79%	15-71%
Soybeans	8-21%	1-14%
Hay	27-71%	19-90%
Cow-Calf	22-58%	14-67%
Feeders	19-50%	8-38%
Finish Cattle	9-24%	1-05%
Farrow Hogs	10-26%	7-33%
Finish Hogs	10-26%	7-33%
Dairy Cows	4-10%	2-10%
Sheep	4-10%	3-14%

It is interesting that of the ten farmers finishing cattle, nine are potential users of home computers. Several mentioned that a feedlot record keeping system would be very useful. At least two are involved in small commercial feedlots. Accurate and timely records would be needed to keep the custom feeder informed of his investment.

One cattle feeder commented "I am glad to fill out the form. My experience with computers is very limited, however, I have been wondering if a farm computer would be feasible. We have started a 1000+ hd. backgrounding lot, and have been doing some custom processing and feeding. The record keeping is getting to be a problem. Also, because of the cattle program we use the commodity futures quite alot. Therefore, a computer capable of handling rations, markets, and records could be a big help."

No reason was found to explain the difference in hay enterprises. The relative difference is not large but might be explained in terms of number of grassland acres. This will be discussed later.

Cross-tabulation of Purchase by Corn produced a significance level of 0.0377, as is seen in Table 2.5. Of the NO group only three out of twenty one (14%) produced corn. Seventeen (45%) of the thirty eight YES farmers raised corn. Being a native of southwest Kansas, the first thing I associated with corn was irrigation. Of the seventeen YES corn farms, only three were non-irrigated.

Table 2.5 : Cross-tab of Purchase by Corn

PURCHASE	CORN		ROW TOTAL
	NOT PRODUCED	PRODUCED	
YES	21 55.3% 53.8%	17 44.7% 85.0%	38 64.4%
NO	18 85.7% 46.2%	3 14.3% 15.0%	21 35.6%
COLUMN TOTAL	39 66.1%	20 33.9%	59 100.0%

Significance = 0.0377

Table 2.6 : Cross-tab of Purchase by Irrigate

PURCHASE	FARM TYPE		ROW TOTAL
	DRYLAND	IRRIGATED	
YES	22 57.9% 53.7%	16 42.1% 88.9%	38 64.4%
NO	19 90.5% 46.3%	2 9.5% 11.1%	21 35.6%
COLUMN TOTAL	41 69.5%	18 30.5%	59 100.0%

Significance = 0.0210

Cross-tabulation of dryland versus irrigated farmers revealed that sixteen (42%) of the YES farms were irrigated compared to only two (10%) of the NO group. Table 2.6 shows the significance of this relationship to be 0.0210. Hand examination of the two irrigated NO farmers' questionnaires revealed that one of them had placed a question mark beside his 'no' answer.

Based on these findings a majority of irrigated farmers are potential users of home computers. The irrigated farms in this survey were all sizes and types. No skewed geographical distribution of irrigated farms was found. Perhaps this relationship can be explained by examining the differences of irrigated and dryland farming.

Irrigation requires a considerable initial expense. If the water is obtained from an underground aquifer, a well must be drilled and the pump set. Almost all forms of irrigation in Kansas require a pump and a power source. Power may be provided by an internal combustion engine or an electric motor. Both forms of power have risen dramatically in cost. If the farmer previously had no row crops such as corn, milo, or soybeans, special equipment would be needed. In the case of corn, the harvesting attachment for the combine can only be used for corn and is a very expensive piece of equipment. Irrigated crops in Kansas require more fertilizer, herbicides and pesticides than most dryland crops. Irrigation provides insurance against drought. But one usually intends to produce higher yields than is possible with normal rainfall. As a crop is pushed to produce to the maximum, management becomes more critical.

The corn farmer also has to decide among a variety of marketing methods. Corn can be harvested as silage, as high moisture corn usually delivered to feedlots, or the farmer can dry the corn and store it in a grainery. This decision must be made at harvest time and requires an

analysis of market conditions, differences in cost of the various methods of harvesting, and time and weather factors. A home computer might not be of great value in predicting the weather but has potential in the other areas. The irrigated farmer may be looking for a tool to assist in the management of this expensive and relatively complex enterprise.

Assuming the preceding factors explain some of the potential use of microcomputers for irrigated farmers, what about the dryland farmer? Twenty two (54%) of the dryland farms were in the YES group. Table 2.7 was constructed to see if any relationships exist between farm size and the percentage of the farm in cropland as opposed to grassland.

Table 2.7 - Purchase Response of Dryland Farmers
by Percent Tillable and Number of Acres

% TILLABLE	ACRES				
	UNDER 500	OVER 500	OVER 1000	OVER 2000	OVER 4000
1-20%		0 X	0		X X
21-40%	0		0 0	0	0
41-60%	0	0 0 X	0 0 0 0 XXXX		
61-80%	0 0 X	X	X X	0 XXX	
81-100	0	0 X	X X X	X X	X

* NOTE: 0 denotes NO farmers
X denotes YES farmers

The occurrence of YES farms increases as the number of acres increase. This is especially evident for the farms over one thousand acres. The YES farms also increase in occurrence as percent tillable increases. These two observations support the hypothesis relating farm size to potential home computer use. Gross income is a more accurate measure of farm size. In most cases one would expect farms of large acreage to have a higher gross income than small acreage farms. Gross income per acre is higher for crop land in Kansas than for grass land.[8] Exceptions to this would be capital intensive enterprises that require a small amount of land such as hog farrowing or finishing, or cattle feeding. As number of acres increase, percent tillable becomes less important. Those farms over four thousand acres and less than twenty percent tillable probably support large cow-calf operations. A line drawn from the lower left corner of Table 2.7 to the upper right corner generally divides many of the YES and NO farmers into their respective groups. The frequency of farms in each Acre and Tillable category is too small to allow a reliable test of significance. The table does support my hypothesis that larger farmers are more likely to utilize a microcomputer.

2-2.3 Educational Background of the Farmer

Table 2.8 presents a summary of the farmers that received instruction in the seven subject areas. Fifty three (71%) of the respondents had received instruction in record keeping. The FRAT group made up the majority as expected, but fifty three percent of the INQR group and all of the RAND group were in the record keeping category. These high percentages had not been anticipated. Even more interesting was the division between the YES and NO groups. Thirty four (90%) of the YES farmers as opposed to ten (48%) of the NO farmers had record keeping instruction. The level of significance of this relationship is 0.0013. To compare irrigated and dryland farmers, all of the irrigated farmers and eighteen (82%) of the dryland YES farmers had record keeping instruction.

Table 2.8 - Education Received by Farmers

<u>SUBJECT</u>	<u>YES</u>	<u>NO</u>
Record Keeping	34-90%	10-48%
Enterprise Analysis	20-53%	6-29%
Tax Planning	19-50%	10-48%
Estate Planning	24-63%	11-52%
Computer Programming	13-34%	10-48%
Programmable Calculators	8-21%	2-10%
Marketing	31-82%	12-57%

There may be several reasons for the preceding observations. A farmer might take a record keeping course because he has the propensity for it. A computer that would aid in the maintenance of records and provide summaries and analysis would compliment that characteristic. If

the potential user manages a large farm, the increased need for records may have led him to take a record keeping course. Because of the additional management requirements, the large farmer may see a computer as a tool that will aid in record keeping. He may see the potential benefits of an accurate and timely set of records and feels a home computer will help.

Table 2.9 - Cross-tab of Purchase by Record Keeping

PURCHASE	RECORD KEEPING		ROW TOTAL
	NO INSTRUCTION	INSTRUCTION	
YES	4	34	38
	10.5%	89.5%	64.4%
	26.7%	77.3%	
NO	11	10	21
	52.4%	47.6%	35.6%
	73.3%	22.7%	
COLUMN TOTAL	15	44	59
	25.4%	74.6%	100.0%

Significance = 0.0013

The fact that twenty (53%) of the YES verses six (29%) of the NO group had taken a course in enterprise analysis supports the preceding observations: The potential user is a farm manager who is looking for tools that will increase his management skills.

Marketing was another subject that many of the YES group had taken. Its chi-square statistic was at the 0.0862 level of significance, above the 0.05 acceptance level. It has been said that farmers are production oriented and lack the skills required to compete successfully in today's markets. The farmers who have recognized the

need for better marketing may see the home computer as potential management tool.

A larger percentage of the YES group had received instruction in each subject than the NO group. The only exception to this was computer programming. Thirteen (34%) of the YES group compared to ten (48%) of the NO group fall into the category referred to as Programmers. The hypothesis that those with instruction in computing would be more likely to utilize a home computer does not hold. The programmer may have a more realistic view of a computer than the non-programmer. The frustration many beginning programmers experience could also be a contributing factor. Evidently my penchant for programming is not a trait shared by the majority of farm programmers.

2-2.4 The Potential User

The potential user of a home computer is a farmer who is interested in maintaining financial and production records. He/she has had instruction in record keeping and possibly marketing. This may be due to a natural desire to keep records or the size and complexity of the farmer's operation may require good records. Two observations support the latter conclusion. First, almost all irrigated farmers were in the YES group. Irrigation adds complexity to a farm and increases costs. Even though the risk of drought is decreased, good management becomes more critical. This may explain the irrigators' purchase response. They were geographically distributed around the state and were of every size. They had about the same types and number of enterprises as the dryland farmers. Corn was the distinct exception.

Many of the potential dryland users have larger acreages which also contain a higher percent of tillable land than the NO group. Gross income may have provided some answers in this area.

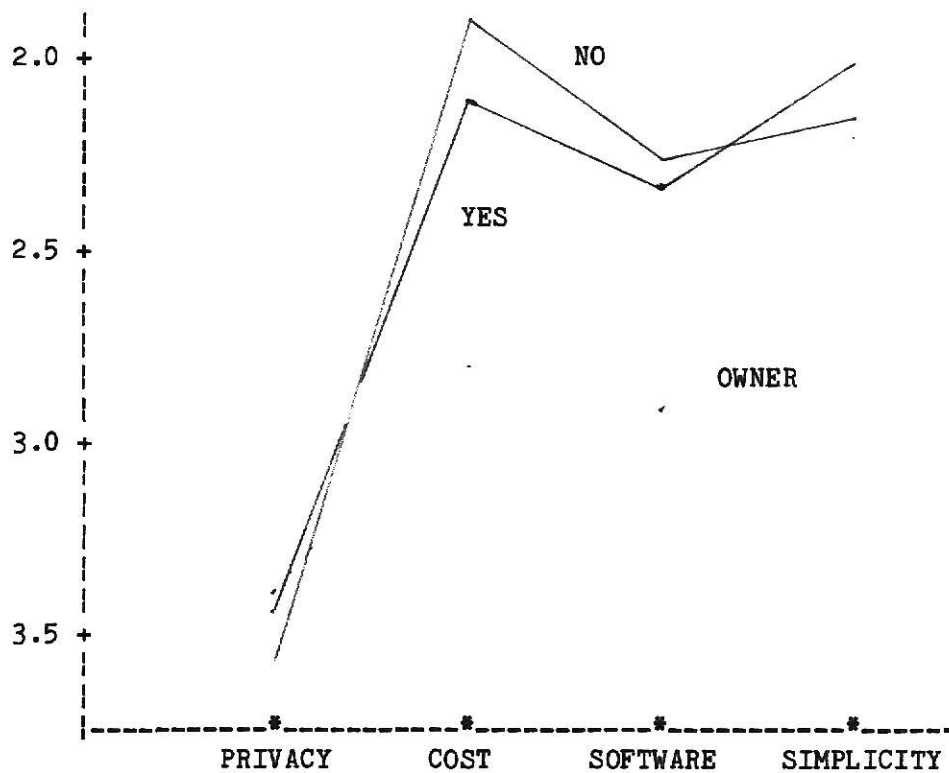
2-3 Rating of Use Factors

The fifth question of the survey involved ranking the following factors in order of importance when considering the use of a computer.

- 1) Privacy of data
- 2) Cost
- 3) Availability of software
- 4) Simplicity of use

The farmers were also encouraged to add other factors they felt were important. Figure 2.1 is a graph of the mean responses of the three groups. The OWNER group was added because of their experience in using a computer.

Figure 2.1 - Graph of Use Factor Means



As is easily seen in the graph, privacy of data is consistently ranked as least important. It was anticipated to be close to first. It is possible the question was misinterpreted. The farmers were to consider all forms of computing when ranking the factors, because of cost and software availability they may have only considered home computers. In that situation, privacy would not be a concern as it is virtually guaranteed. A separate ranking for home computers and one for other forms may have been needed.

The small spread between means makes it difficult to place the factors in an absolute rank order. Thus it is more valuable to discuss similarities in ranking by the three groups. In every instance Availability of Software was ranked lower than Cost or Simplicity. When constructing the questionnaire, 'ready to use programs' was added beside Availability of Software as an explanation for those who were not familiar with the term software. Perhaps the farmers think they don't want canned programs but would rather do the programming themselves or hire a custom programmer. If this is so, it is highly possible they do not fully understand what software is and how difficult and expensive it can be to produce.

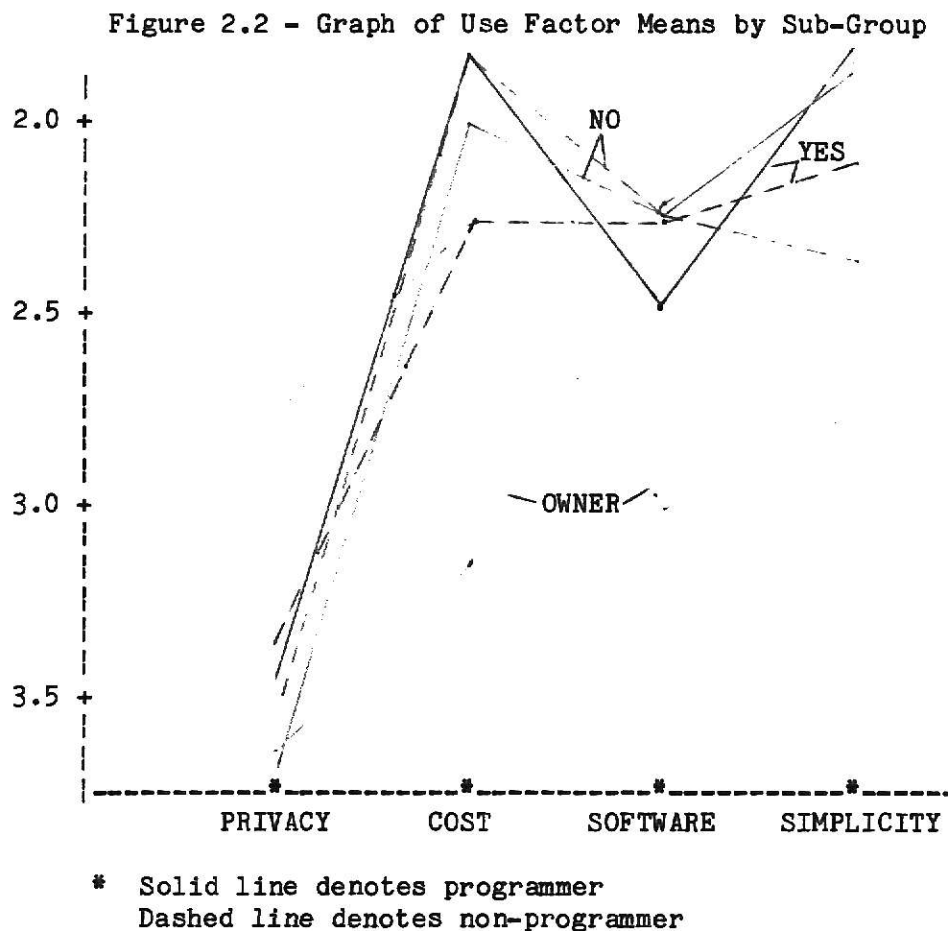
The YES and OWNER group ranked Simplicity of Use as most important. Perhaps they feel Software Availability isn't so important, if only the machines were simpler to program. Probably the farmer is saying he wants a simple machine to use. He has probably heard horror stories about those complicated black boxes and we have all seen the blinking lights and heard the strange noises computers make on television. To the farmer, ease of use and ease of programming or of obtaining programs may all fall into the Simplicity of Use category.

The rankings of the NO group followed about the same pattern as the YES and OWNER groups. The NO group did rank cost as being the most

important use factor. This group is comprised of smaller farmers; cost justification is more difficult for the NO group.

The NO group had a larger percentage of programmers than the YES group. If that factor contributed to the purchase response the reason might be revealed by dividing the use factor responses into programmer and non-programmer categories for each group. Figure 2.2 is a graph of those means.

One important observation can be made. All three sub-groups of programmers ranked Simplicity of Use higher than did the non-programmers. The surprising fact is that the OWNER non-programmers ranked both Simplicity of Use and Availability of Software lower than did the OWNER programmers. It should be noted that the frequencies of the OWNER sub-groups are low.



It is interesting that the OWNER programmers ranked Software Availability higher than any other sub-group. Perhaps they have a better understanding of the term software and its implications. The NO and OWNER non-programmers ranked Cost as most important. This may indicate they know more about the cost of these systems than any other aspect of computing.

To summarize, the respondents ranked cost and simplicity at about equal importance. Availability of Software was ranked a little lower. It seems reasonable to conjecture that if agriculture became more profitable Cost would drop in importance and Software Availability would assume a much higher rank. Simplicity of Use will always be important.

One farmer who is also a computer operator for a rural bank ranked Simplicity first and Software Availability second. He added this comment, "Most farmers will not consider themselves smart enough to use a computer unless they can be shown otherwise. The programs should be aimed at being 'operator proof', catching some of the data entry errors and giving simple instructions for corrections and continuation. Buzzing alarms or locked up keyboards only frustrate beginning operators."

The farmers mentioned several other factors in addition to the preceding four. Two of them relate to Software Availability. Almost all of the following comments came from farmers who already owned a home computer.

- 1) Service
- 2) Reliability
- 3) Flexibility (software)
- 4) Feasibility
- 5) Hardware availability
- 6) Availability of custom programming
- 7) Memory size and speed of CPU

The previously mentioned comment on custom programming was considered the most important use factor by a farmer who has owned a home computer for almost three years. He said 'canned' programs didn't work for him, but he hadn't had any luck finding an agriculturally oriented custom programmer. A telephone conversation revealed that he had since found a custom programmer only to be told it would cost him thirty or forty dollars per hour. He is now in the process of writing as many Land Grant Universities as possible in hopes of finding 'canned' programs.

2-4 Use of Computing Tools

Question number six asked the farmers to rate five performance factors relating to the computing tools they had used. Table 2.10 lists the use frequency of each tool. The 'other' computing services mentioned were the Dairy Herd Improvement Association (DHIA) and the Angus Herd Improvement Association (AHIA). Because of the low frequency of response the 'other' services will be omitted from the discussion except to say both the DHIA and the AHIA received very high ratings.

Table 2.10 - Use Frequencies of Computing Tools

<u>COMPUTING TOOLS</u>	<u>YES</u>	<u>NO</u>	<u>OWNER</u>
Programmable Calculator (PC)	10-26%	3-14%	6-50%
Home Computer (HC)	3-08%	-	12-100
Extension Computing (EXT)	14-37%	6-27%	4-33%
Commercial Computing (COMM)	14-37%	2-10%	3-25%
Other	2-05%	-	1-08%

The YES group has utilized computing tools to a greater extent than the NO group. Because the NO group is comprised of smaller farms, they may not have a great need for computing.

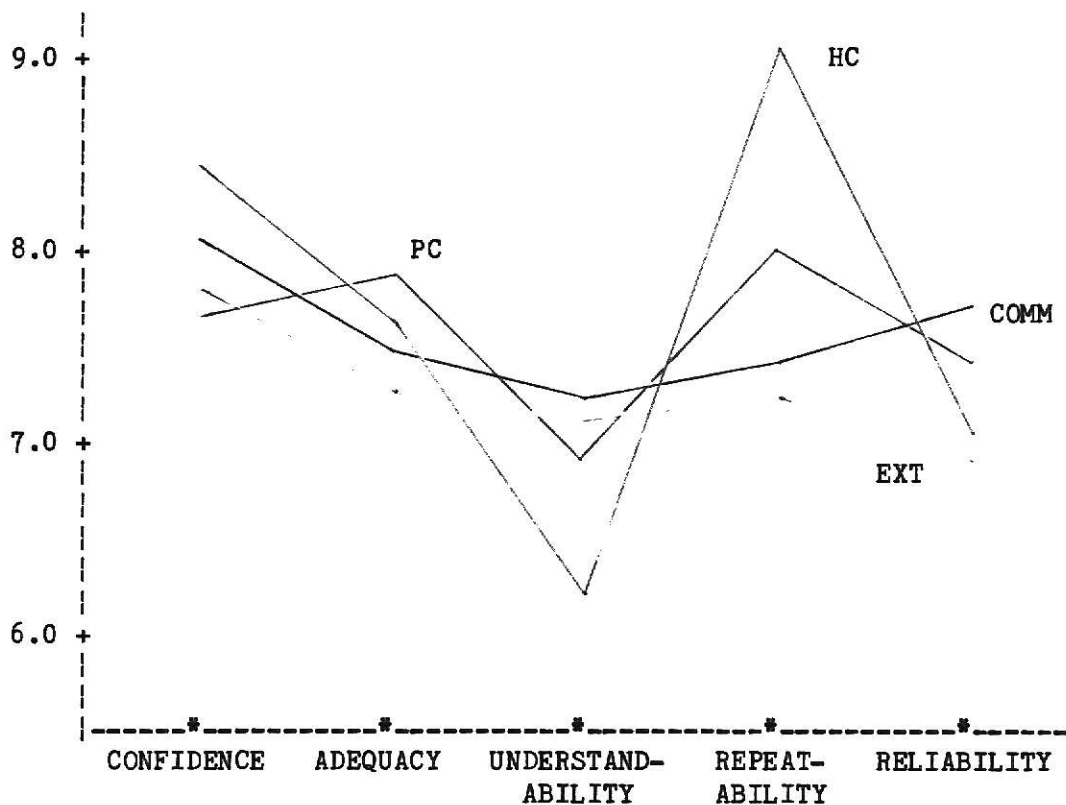
The most frequent use of computing by the YES group has been through the extension service and commercial computing services. Both of these services involve trained professionals. the OWNER group had utilized the hands-on tools, programmable calculators and home computers, more frequently than any other tool. This observation provides a good profile of the OWNER group.

The farmers were asked to rate performance factors of tools they had used. They were to rate the following factors on a scale of 1 (very low) to 10 (very high).

- 1) Confidence in results
- 2) Degree to which its performance matched your expectations (Adequacy)
- 3) Understandability of procedures and instructions
- 4) Desire to use it again (Repeatability)
- 5) Reliability (freedom from program of mechanical errors)

The mean rating for each factor was calculated. The low frequency of use of many of the tools required the groups be combined into a 'total' group to allow meaningful interpretation. The mean rating was calculated for each tool's factors based on the 'total' group. Figure 2.3 is a graph of the means.

Figure 2.3 - Graph of Performance Factor Means



The most significant observation is what I call the 'repeatability phenomenon'. Regardless of how low understandability was rated, repeatability was high. This is especially evident with the hands-on equipment. Programmable calculators and home computers exhibit relatively low understandability yet their repeatability was rated very high. The understandability of hands-on tools is essential for successful use. Because of the computer's black box image farmers may anticipate that hands-on tools are difficult to use and hard to understand, even if they have never used them.

It appears that farmers are willing to keep trying these tools regardless of how difficult they are to understand. It would be interesting to know what keeps bringing them back. One farmer commented, "We have not used any of these tools. But I know we should be." Perhaps they feel the 'computer revolution' is passing them by and the home computer may look like a way to catch up.

Confidence in results was rated relatively high in all categories. Even though computers get blamed for electric bill errors, and fertilizer and seed bill errors too, it looks like these farmers trust them. Results can seem more accurate and 'scientific' when printed on green and white striped computer paper.

It was expected that programmable calculators and home computers to be rated lower than the other services for the Adequacy factor. Just the opposite is true, although the range is very small. It was also assumed many farmers would find the hands-on tools fell short of promised results. But even farmers who ranked Adequacy low usually ranked Repeatability high.

The commercial services were rated most reliable. The extension service was rated lowest in this category. Once again the hands-on tools were expected to receive the lowest ratings.

Farm computer users are a resilient group. They have a strong desire to use computing tools in spite of the many difficulties. The closer the computer gets to the farmer's office, or kitchen table, the more satisfied he may be. The privacy offered by the hands-on tools may contribute to their high repeat rating. I have heard too many comments about the 'government not needing to know that information' to think otherwise.

2-5 Functions Performed by Computing Tools

Table 2.11 lists the functions that computing tools have performed for farmers. Financial record keeping is the most used function. Break even analysis and production record keeping follow. Ration formulation was another function used frequently.

It is interesting that the NO group used financial record keeping less than production record keeping. This is opposite of the other groups. Being comprised of small farmers the NO group may not have the need for computer maintenance of records. The YES and OWNER groups may have large operations that require them to look for outside assistance. The frequencies are low so the results may not be representative.

Overall, it appears that farmers are using computing tools for record keeping. Accurate and complete records of an operation are essential before useful economic analysis can be performed. These farmers seem to realize this necessity.

Table 2.11 - Functions Performed by Computing Tools

<u>FUNCTION</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>
Financial Record Keeping	10-83%	15-58%	4-40%
Break Even Analysis	8-67%	15-58%	5-50%
Production Record Keeping	7-58%	13-50%	6-60%
Ration Formulation	5-42%	9-35%	4-40%
Market Analysis	2-17%	2-08%	1-10%
Estate Planning	1-08%	5-19%	3-30%
Equip. Maintenance Records	1-08%	-	-
Purebred Cattle Marketing	1-08%	-	-
Cow Herd Breeding Eval.	-	1-04%	-
Energy & Insultion Eval.	-	1-04%	-
Linear Programming	-	-	1-10%

2-6 Estimated Purchase Time

The YES respondents were asked to estimate when they planned to purchase a home computer. One (03%) checked this year and ten (27%) indicated a purchase in one to two years. The short time period indicates they are definite in their plans.

As Table 2.12 indicates, seventy percent of the farmers fall in the three years or more category. Two said they were waiting for the price to drop like the calculator market of the 1970's. One said he would get a computer eventually but they weren't developed enough to be useful yet. Another said he'd let his neighbors work the 'kinks' out of them first.

The importance of Cost combined with the distant purchase date of the majority indicates the potential user is waiting until the cost can be justified.

Table 2.12 - Estimated Time of Purchase

<u>TIME</u>	<u>FREQUENCY</u>
This Year	1-03%
1-2 Years	10-27%
3-4 Years	11-30%
Over 5 Years	15-40%

2-7 Summary of Attitudes

Farmers rank cost and simplicity of use as the most important factors. The high ranking of cost may indicate that farmers aren't convinced a computer will pay for itself. The depressed economic condition of agriculture could also account for the cost factor.

Most farmers, potential users or not, are very willing to repeat the use of computing tools. The hands-on tools receive the highest rating in this category.

Given this desire to repeat use and the fact that cost ranks very high the following conclusion is offered. Farmers are very willing to use computers in management, but only if the computer will pay for itself and add to the profitability of the farm. The computer will have to endure the same cost/benefit analysis that all potential agricultural tools sustain.

Chapter 3

Functions and Feasibility of a Farm Microcomputer

3-1 Overview

The final objective of the survey was to determine the functions farmers want a home computer to perform. Nineteen 'survey' functions were listed on the questionnaire. From the respondents' comments, thirteen 'additional' applications were defined.

This chapter will list the functions desired by farmers, discuss implementation and use feasibility, and comment on the unique farmer-computer interface.

3-2 Functions Requested

The farmers were asked to check and/or enumerate those functions they want a home computer to perform for them. Table 1 of Appendix D lists the survey functions in decreasing order of preference. This ranking was determined by combining the OWNER and YES groups into one USER group. The individual groups are included for comparison.

Table 2 of Appendix D lists the additional functions requested by farmers. The fact many farmers spent extra time writing comments grants these functions special consideration.

3-3 Saleability

Ranking the functions in order of preference essentially indicates their saleability. The preference of the majority was used to distinguish between the saleable and non-saleable functions. Twelve functions were requested by at least one half of the USER group. These are labeled the Saleable functions. This is not to imply the non-saleable functions are not useful, but they would not serve the

needs of the majority of USER's.

The inclusion of the first four functions from the additional list expands the Saleable group to a total of sixteen functions. The assumption is made that these four functions would have been requested by the majority had they been included as survey functions. Table 3.1 lists the Saleable functions.

Financial record keeping is the most requested function. At least three fourths of the farmers also requested balance, income, and cash flow statements; break even analysis; and crop production record keeping. These four functions plus livestock production record keeping provide the basis for any further analysis that a farmer would want to perform. That they are the most requested functions indicates farmers are cognizant of the necessity for timely and accurate records. The high ranking of balance, income and cash flow statements expresses the importance of debt financing in these farmers' operations.

The value attached to financial planning is indicated by the fact that over two thirds of the USER's requested preparation and analysis of budgets. It is also apparent that the USER's want to be kept informed of their markets. Maintenance and trend analysis of commodity prices are functions found in Table 3.1. One farmer said bar graphs or simple moving averages would help him keep up with the current market situation.

It is to the farmers' credit as businessmen that functions involving finance, budgeting, production, marketing and break even analysis were requested by the majority.

Table 3.1 - Saleable Functions

<u>FUNCTION</u>	<u>USER</u>
1) Financial Record Keeping	47-94%
2) Balance Sheet, Income, Cash Flow Statements	42-84%
3) Break Even Analysis of Individual Enterprises	39-78%
4) Crop Production Records by Fields	37-74%
5) Depreciation Scheduling	34-68%
6) Analysis of Proj. Budgets vs. Actual Expenditures	33-66%
7) Livestock Production Records	33-66%
8) Budget Preparation	32-64%
9) Periodic Summary Reports of Production	30-60%
10) Least Cost Ration Formulation	29-58%
11) Maintaining Records of Commodity Prices	27-54%
12) Harvest Records (lbs., bu., moisture, rent share, etc.)	27-54%
13) Equipment Maintenance Records	5-10%
14) Market Analysis, Charting of Prices	5-10%
15) Records of Personal Futures Trading Activity	4-08%
16) Calendar - Diary, Future Events	3-06%

3-4 Feasibility

Feasibility can be expressed in terms of that which is practical, beneficial, advantageous, or profitable. In this report it is applied as a measure of the technical aspects of implementing, and the practicality of using the saleable functions.

When microcomputers were first introduced to the general public three or four years ago, they were limited to four or eight kilo bytes (kbytes) of random access memory (ram). The auxiliary storage consisted of a cassette tape and recorder with a very slow transfer rate. Today, microcomputers are available with up to one hundred twenty eight kbytes of ram and can access fast auxiliary storage such as floppy or even hard disks with capacities of several megabytes of memory. Technical feasibility is fast becoming a question of the past. However, there are a few functions in the total list of thirty two that could be judged as technically infeasible.

Of the saleable functions, market analysis may be the only one infeasible to implement. This depends on the amount of analysis to be performed. Simple charting of bar graphs and calculation of moving averages could easily be implemented for a few commodities. Complex analysis requiring a vast amount of statistical functions and an extensive data base of historical commodity prices would be better suited to the commodity trading organizations and their large mainframe computers.

Production record keeping could become very complex and extensive depending on the detail a farmer wanted. The limiting factor in this case is the time the farmer wants to spend keying in production data. His clerical skills and patience will probably be overloaded before the machine's capabilities are exceeded.

Preparation of income tax is a function best left to tax

consultants. To implement the Internal Revenue Tax Code on a microcomputer would require more than an act of congress. The fact that the majority didn't want a microcomputer to perform income tax preparation indicates they understand the limits of a computer or they are satisfied with their present form of tax management.

Automatic weather recording is a function the National Weather Bureau has been trying to achieve for years. If the farmers who requested this function only want periodic recording of wind speed, temperature and rainfall, the necessary analog-to-digital devices exist. This would also require the services of a real-time operating system.

Irrigation pump monitoring falls into the same category as weather records. Dedicated systems designed to monitor pivot sprinkler irrigation exist, but these monitors are only feasible for large operations (scores of sprinklers).

Most of the saleable functions could be implemented on a microcomputer that had adequate auxiliary storage. The important consideration is the cost of implementation versus the benefits received. It is not the purpose of this report to perform a cost/benefit analysis of each of the saleable functions. The benefits derived from these functions will be measured in part by the frequency of use necessitated by changing conditions. If a farmer doesn't rerun the break even analysis of an enterprise when factors such as interest rates, fuel costs, or potential yield change, then the break even analysis program will be of little value.

Historically computers have worked most efficiently when 'number crunching'. Digesting mass quantities of numbers and equations is the original purpose for which computers were designed. A farm operation has little need for complex and lengthy calculations. An exception would be least cost ration formulation involving linear programming.

However, computers are also very fast at sorting and searching information. Once data is in memory, a computer can manipulate it much faster than a human can by hand. This 'massaging of data at blinding speed' is a primary advantage of a computer.

Looking at the saleable functions, two catagories of applications emerge. Those that enter data into the computer for storage, i.e. record keeping, and those that sort, search, and compute, i.e. reports and analyses. The farmer will find that as much time is required to key stroke data into the computer as was needed to record it by pushing a pencil. A few of the farmers expressed an awareness of this fact. Many of them also commented that although they keep good records, they don't have the time to 'massage' it into useful information. This is the area the computer will provide valueable assistance and thus prove 'feasible'.

An owner of a microcomputer expressed his experience in the following excerpt from a telephone conversion. "I have always kept detailed records of my purebred cow herd hoping to have the time to do something with them (the records). Now that we have a home computer and the novelty has worn off I find that it takes just as much time and discipline to sit down at the machine and enter the data as it did by hand. The collection and recording of data is not any easier, but when I want the average weaning weight of cow number seventeen's calves, a couple of instructions to the computer is all it takes. By hand, I would have to pull the records, do the calculations, and then remember to put the records back in he right file. We had to program the computer to do the same thing but it always remembers and does it much faster than we could." This was not the only expression of 'I keep records but don't have time to do anything with them.'

Thus the process of retreival and manipulation of data will be the

primary advantage of a microcomputer on the farm. The record keeping functions will allow the farmer to store his data in an organized manner. The reporting and analysis functions will aid the farmer in transforming his data into useful management information.

3-5 Man-Machine Interaction

In order for the computer to perform its functions the farmer will need to communicate his instructions to the computer. The human interface with a computer is often a difficult and frustrating interaction.

The farmer is in a category unique to other businessmen. Most businesses, large or small, have at last one department or one person assigned to handle data processing (DP). Management very seldom interacts with a computer but communicates his ideas or wishes to a member of the DP staff. The farmer does not have a DP department nor even a clerical support staff. The farm manager responsible for purchasing the computer is also the same individual who will be doing the data entry and following those oftentimes confusing instructions. Because of this unique position the farm computer will have to be designed around the concept of a 'friendly user interface'. The notion of files, I/O device numbers, and complex operating system commands will need to be handled by this interface. The farmers need not be concerned with any more than turning on the switch, inserting a diskette or two, and requesting the information desired.

The concept of 'peaceful' interaction suggests the development of a data base management system for the farm microcomputer. This is a tool employed by many large businesses today. The evolution of business computing has been one of a progressive development of data processing techniques.[9] Initially many files were used to contain the data

needed by each department or function of the business. This led to duplication of data which often produced inconsistencies. Because identical or related data was used for more than one application, the concept of integrating data was developed.

Essentially a data base management system (DBMS) provides a map, or schema, of the data base to the application program that will allow the program to store, retrieve, change, or delete the required data. The DBMS assumes the overhead tasks, once required of the operator or applications programmer, needed to access the data base. It also provides for data integrity, security, and recovery procedures.

The definition and development of a farm's data base(s) and the accompanying DBMS is an area of future research with tremendous potential. The data base management system is the cornerstone of the microcomputer foundation that will insure the feasibility of on-the-farm computing for the farm manager of the future.

Concurrent to the need for a DBMS is a simple query language and report writing facility. Tools that would allow easy access to relevant data without complex programming and the subsequent output of that data on a report with farmer-defined headings would be a useful aid to the farm microcomputer system. This facility could also include graphics capabilities for those that find graphs easier to interpret than tables.

3-6 Summary

The saleable functions are within the hardware capabilities of the microcomputer of the 1980's. The feasibility of using these functions will depend on the ease with which the farmer can store, access, and then massage the data into useful management information. Farm computing is basically at the same infancy stage that business found itself in over twenty years ago. The quicker the chasm between 1960 and 1980 can be bridged, the more feasible an on-the-farm computer will become.

4-1 Potential for Microcomputers

A microcomputer is a tool that can be used in farm management. Many farmers sense this capability as indicated by the sixty four percent of non-owners who said they planned to purchase a microcomputer in the future.

The larger farmer who has had instruction in record keeping is the most likely user. He/she ranks cost and simplicity of use as being very important factors. The farm microcomputer must endure the same cost/benefit analysis as all farm tools and it must be simple to operate.

Farmers want microcomputers to perform many of the operations that other computing tools are performing for them now. They expect the microcomputer to store their financial, production, and marketing data and to retrieve this data for analysis and reporting. The input of data will be tedious and time consuming. The farmer has no clerical support staff to assume this burden. For this reason a friendly user interface is needed. The development of this interface between man and machine can be greatly enhanced by a data base management system and an accompanying query language and report writing facility. These computer related concepts are being utilized by business today.

4-2 Future Research

Further research is needed in the following areas to insure the feasibility of a farm microcomputer system.

1) Data base design.

It appears there may be three or four data bases that would maintain the farmers' data in an organized format. Data bases for time dependent (calendar), financial, crop production, and livestock production data are logical separations but research to define the necessary records is needed before the data bases can be thoroughly designed.

2) Data base management system design.

This is a tool that could relieve the farmer of many computer-related tasks. It would aid in the development of a friendly user interface. Once the data bases have been defined the development and implementation of a DBMS for a farm microcomputer could occur.

3) User Interface.

Questions concerning farm managers' hands-on use of computers need to be asked and answered. Farmers may be different in their reactions to computers than other businessmen. Will their familiar use of mechanical tools affect their interaction with computers? Do they interpret graphs easier than tables? What command format and language can they understand most easily? How can data entry be enhanced? Many of these questions are in the realm of human engineering.

4) Survey of Available Hardware.

Many microcomputers and peripheral equipment exists. Size, speed, cost and available interfaces with other equipment need to be determined. Portability of software between different brands should also be examined.

Considerable research and work is needed to transform a microcomputer from a CPU and memory to a useful tool the majority of farmers can use as an aid in decision making. The potential is tremendous. Farmers know they need timely and accurate analysis of their financial, production, and marketing data to remain competitive. They are looking to the microcomputer as the tool that will assist them in the transformation of that data into useful management information.

References

1. "Survey of Availability of Micro and Mini Computer Software," The Southern Extension Farm Management-Marketing Committee Joint Personal Computer Task Force Preliminary Report, University of Florida, 1980.
2. "Electronic Decision Aids Available From Kansas State University," Agricultural Economics Extension Service, Kansas State University, 1980.
3. Nelson, T. R., "Descriptions and Sample Illustrations of OSU Microcomputer Programs," Department of Agricultural Economics, Extension Farm Management, Oklahoma State University, 1980.
4. "Software Available For TRS-80-1," Summerville Enterprises, Aliceville, Alabama, February 1980.
5. "Farm Computer Programs For The TRS-80," GEORU, Inc., St. Louis, Missouri, 1980.
6. Statistical Package For The Social Sciences, McGraw-Hill Book Company, 1975.
7. Introduction To Probability And Statistics, Duxbury Press, 1975, p. 283-287.
8. 62nd Annual Report and Farm Facts, Kansas State Board of Agriculture, Topeka, Kansas, 1979, p. 102-103.
9. Sibley, E. H., "The Development of Data-Base Technology," Computing Surveys, Vol. 8, NO. 1, March 1976.

Appendix A
The Questionnaire

Figure 1 - The Cover Letter

Department of Computer Science

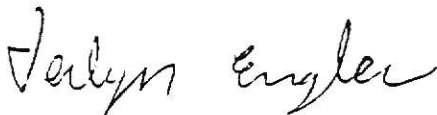
Fairchild Hall
Manhattan, Kansas 66506
913-532-6350

Home (micro) computers are receiving considerable attention as an aid to farmers in the maintenance and analysis of financial and production data. Micros ranging in price from 500 to 5000 dollars are being purchased for use in farming operations.

My interest in micro computers in farm management has developed from a background of farming in western Kansas and my present work as a graduate student in computer science. As part of my graduate work I am conducting a survey of farmers' present utilization of computing tools, attitudes toward the use of those tools, and features of a home computer which would assist in farm management.

Please complete the survey and return it in the enclosed stamped envelope. The results will be sent to you when the tabulation is completed.

Thank you for your time and thoughtful consideration.

A handwritten signature in cursive script that reads "Verlyn Engler". The ink is dark and the signature is fluid.

Verlyn Engler

Figure 2 - Front Side of Questionnaire

1. Check type of crops and livestock produced on your farm.

☐ wheat	☐ Beef cattle	☐ Hogs	☐ dairy cows
☐ corn	☐ cow/calf	☐ farrowing	
☐ rice	☐ feeder	☐ finishing	☐ sheep
☐ soybeans	☐ finishing		
☐ hay			

2. Number of acres managed.

☐ upto 500
☐ over 500
☐ over 1000
☐ over 2000
☐ over 4000

3. Check appropriate box for percentage of farm under cultivation and the percentage of farm irrigated.

	0 %	1 - 20	21 - 40	41 - 60	61 - 80	81 - 100	100 %
percent tillable							
percent irrigated							

4. Check the subjects you have received instruction in by attending classes, workshops, extension seminars or other _____.

☐ record keeping
☐ enterprise analysis
☐ tax planning
☐ estate planning
☐ computer programming
☐ use of programmable calculators (TI-59, HP-37, etc.)
☐ marketing (use of hedging, forward contracting)

5. Rate the following factors in order of importance when considering the use of a computer in your farming operations. (1 = most important)

☐ privacy of data
☐ cost
☐ availability of software (ready-to-use programs)
☐ simplicity of use
☐ other _____

Figure 3 - Back Side of Questionnaire

6. Listed below are several computing tools/services and performance factors. Rate the ones you have used on a scale of 1 to 10, where 1 is very low and 10 is very high. Comments are welcomed.

	programmable calculator	home computer	computing service of extension or university	commercial computing service (thru bank, accountant, etc.)	other (specify)
confidence in results					
degree to which it's performance matched your expectations					
understandability of procedures and instructions					
desire to use it again					
reliability (freedom from program or mechanical errors)					

7. If you have used any of the above, what functions did they perform?

☐ financial record keeping ☐ market analysis
☐ production records ☐ estate planning
☐ ration formulation ☐ other _____
☐ break even analysis

8. Is the purchase of a home computer in your future plans? _____

If so, estimate when: ☐ this year
 ☐ 1 - 2 years
 ☐ 3 - 4 years
 ☐ over 5 years

9. Check the following functions you would like a home computer to perform in your farming operations.

☐ financial record keeping
☐ depreciation scheduling
☐ balance sheet, income, cash flow statements
☐ payroll
☐ income tax preparation
☐ budget preparation
☐ analysis of projected budgets vs. actual expenditures
☐ crop production records (by field)
☐ livestock production records
☐ break even analysis of individual farm enterprises
☐ least cost ration formulation
☐ nutrient analysis of rations (estimated protein, energy of a given ration)
☐ calculation of chemical and fertilizer application rates
☐ planting rates
☐ maintaining records of commodity prices
☐ calculation of grain storage costs.
☐ harvest records (calculation of net lbs., bu., moisture discount, rent share, etc.)
☐ calculation of various weights and measures; conversion to metric
☐ periodic summary reports of production

Please use the extra sheet to list functions you would like a home computer to perform which weren't included in the above list. Any additional comments would be appreciated.

Appendix B

Frequencies by Question and Survey Group

List of Tables

1	Crop and Livestock Production	B- 3
2	Number of Acres Managed	B- 4
3	Percent of Land Tillable.	B- 5
4	Percent of Land Irrigated	B- 6
5	Education Received.	B- 7
6	Ranking of Use Factors.	B- 8
7	Use of Computing Tools.	B- 9
8	Rating of Programmable Calculators.	B-11
9	Rating of Home Computers.	B-12
10	Rating Of Extension Computing Service	B-14
11	Rating of Commercial Computing Services	B-16
12	Rating of Other Computer Services	B-18
13	Previous Uses of Computing Tools.	B-20
14	Response to Home Computer Purchase.	B-21
15	Estimated Purchase Time	B-22
16	Functions Desired	B-23

Table 1 - Crop and Livestock Production

<u>COMMODITY</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Wheat	9-100	14-82%	48-98%	71-95%
Corn	7-78%	9-53%	16-33%	32-43%
Milo	8-89%	11-65%	37-76%	56-75%
Soybeans	-	4-24%	10-20%	14-19%
Hay	6-67%	13-76%	40-82%	59-79%
Cow - Calf	3-33%	9-53%	31-63%	43-57%
Feeders	4-44%	9-53%	23-47%	36-48%
Finish Cattle	-	4-24%	9-18%	13-17%
Farrow Hogs	-	3-18%	18-37%	21-28%
Finish Hogs	1-11%	4-24%	15-31%	20-27%
Dairy Cows	-	2-12%	5-10%	7-09%
Sheep	-	2-12%	6-12%	8-11%

Table 2 - Number of Acres Managed

<u>ACRES</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Upto 500	1-11%	3-18%	6-12%	10-13%
Over 500	-	4-25%	8-16%	12-16%
Over 1000	2-22%	2-12%	19-39%	23-31%
Over 2000	2-22%	6-35%	11-22%	19-25%
Over 4000	4-44%	2-12%	5-10%	11-15%

Table 3 - Percent of Land Tillable

<u>PERCENT TILLABLE</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
1 - 20%	-	3-18%	4-08%	7-09%
21 - 40%	-	3-18%	6-12%	9-12%
41 - 60%	-	5-29%	14-29%	19-25%
61 - 80%	2-22%	-	14-29%	16-21%
81 - 99%	3-33%	2-12%	10-20%	15-20%
100%	4-44%	4-24%	1-02%	9-12%

Table 4 - Percent of Land Irrigated

<u>PERCENT IRRIGATED</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
0%	3-33%	9-53%	34-69%	46-61%
1 - 20%	-	4-24%	6-12%	10-13%
21 - 40%	-	1-06%	4-08%	5-07%
41 - 60%	1-11%	1-06%	1-02%	3-04%
61 - 80%	2-22%	1-06%	-	3-04%
81 - 99%	2-22%	1-06%	3-06%	6-08%
100%	1-11%	-	1-02%	2-03%

Table 5 - Education Received

<u>SUBJECT</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Record Keeping	9-100	9-53%	35-71%	53-71%
Enterprise Analysis	2-22%	7-41%	22-45%	31-41%
Tax Planning	5-56%	4-24%	55-51%	34-45%
Estate Planning	5-56%	4-24%	30-61%	39-52%
Computer Programming	3-33%	6-35%	20-41%	29-39%
Programmable Calculators	3-33%	5-29%	3-06%	11-15%
Marketing	6-67%	10-59%	35-71%	51-68%

Table 6 - Ranking of Use Factors

<u>RANK</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
PRIVACY				
First	1-11%	1-06%	3-06%	5-07%
Second	-	1-06%	3-06%	4-05%
Third	1-11%	2-12%	11-22%	14-19%
Fourth	4-44%	10-59%	28-57%	42-56%
COST				
First	1-11%	-	23-47%	24-32%
Second	3-33%	5-29%	10-20%	18-24%
Third	5-56%	7-41%	7-14%	19-25%
Fourth	-	2-12%	6-12%	8-11%
AVAILABILITY OF SOFTWARE				
First	2-22%	7-41%	9-18%	18-24%
Second	4-44%	2-12%	14-29%	20-27%
Third	1-11%	1-06%	15-31%	2-23%
Fourth	2-22%	1-06%	7-14%	10-13%
SIMPLICITY OF USE				
First	4-44%	4-24%	14-29%	22-29%
Second	4-44%	6-35%	2-37%	28-37%
Third	1-11%	4-24%	11-22%	16-21%
Fourth	-	1-06%	3-06%	4-05%

Table 7 - Use of Computing Tools

<u>TOOLS USED</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Programmable Calculator	4-44%	9-53%	6-12%	19-25%
Home Computer	2-22%	13-76%	-	15-20%
Extension	2-22%	5-29%	19-39%	26-35%
Commercial	5-56%	3-18%	12-24%	20-27%
Other	-	1-06%	2-04%	3-04%

Table 8 - Rating of Programmable Calculators

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	1-12%	-	1-06%
2	-	-	-	-
3	-	-	-	-
4	-	-	1-17%	1-06%
5	-	1-12%	-	1-06%
6	-	-	-	-
7	-	1-12%	2-23%	3-17%
8	1-25%	3-38%	1-17%	5-28%
9	1-25%	1-12%	-	2-11%
10	2-50%	1-12%	2-33%	5-28%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	1-11%	-	1-05%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	1-25%	2-22%	-	3-16%
6	-	-	1-17%	1-05%
7	-	-	-	-
8	-	2-22%	2-33%	4-21%
9	1-25%	2-22%	1-17%	4-21%
10	2-50%	2-22%	2-33%	6-32%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	1-11%	-	1-05%
2	-	-	-	-
3	-	-	-	-
4	1-25%	-	1-17%	2-10%
5	2-50%	-	1-17%	3-16%
6	-	1-11%	-	1-05%
7	1-25%	1-11%	-	2-10%
8	-	2-22%	2-33%	4-21%
9	-	3-33%	1-17%	4-21%
10	-	1-11%	1-17%	2-10%

Table 8 - Rating of Programmable Calculators
(cont)

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	1-11%	-	1-05%
2	-	1-11%	-	1-05%
3	-	-	-	-
4	-	-	-	-
5	-	-	1-17%	1-05%
6	-	-	-	-
7	1-25%	-	1-17%	2-10%
8	-	2-22%	2-33%	4-21%
9	-	1-11%	1-17%	2-10%
10	3-75%	4-44%	1-17%	8-42%
RELIABILITY				
1	-	1-11%	-	1-05%
2	-	-	-	-
3	1-25%	-	-	1-05%
4	-	-	-	-
5	1-25%	-	1-17%	2-10%
6	-	-	1-17%	1-05%
7	-	1-11%	1-17%	2-10%
8	1-25%	3-33%	2-33%	6-32%
9	-	-	1-17%	1-05%
10	1-25%	4-44%	-	5-26%

Table 9 - Rating of Home Computers

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	1-12%	-	1-10%
5	-	-	-	-
6	-	-	-	-
7	-	1-12%	-	1-10%
8	1-50%	-	-	1-10%
9	1-50%	3-38%	-	4-40%
10	-	3-38%	-	3-30%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	-	1-09%	-	1-08%
4	-	-	-	-
5	-	2-18%	-	2-15%
6	1-50%	-	-	1-08%
7	-	1-09%	-	1-08%
8	-	2-18%	-	2-15%
9	1-50%	1-09%	-	2-15%
10	-	4-36%	-	4-31%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	1-08%	-	1-07%
2	-	-	-	-
3	-	1-08%	-	1-07%
4	-	2-17%	-	2-14%
5	-	-	-	-
6	1-50%	2-17%	-	3-21%
7	-	2-17%	-	2-14%
8	1-50%	2-17%	-	3-21%
9	-	1-08%	-	1-07%
10	-	1-08%	-	1-07%

Table 9 - Rating of Home Computers
(cont)

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	1-09%	-	1-08%
6	-	-	-	-
7	1-50%	-	-	1-08%
8	-	1-09%	-	1-08%
9	-	2-18%	-	2-15%
10	1-50%	7-64%	-	8-62%
RELIABILITY				
1	-	-	-	-
2	-	-	-	-
3	1-50%	1-09%	-	2-15%
4	-	1-09%	-	1-08%
5	-	1-09%	-	1-08%
6	-	-	-	-
7	-	-	-	-
8	1-50%	4-36%	-	5-38%
9	-	3-27%	-	4-23%
10	-	1-09%	-	1-08%

Table 10 - Rating of Extension Computing Service

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	1-25%	-	1-04%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	1-50%	-	3-18%	4-17%
6	-	-	1-06%	1-04%
7	-	1-25%	2-12%	3-13%
8	1-50%	1-25%	5-29%	7-30%
9	-	-	4-24%	4-17%
10	-	1-25%	2-12%	3-13%
ADEQUACY OF EXPECTED PERFORMANCE				
1	1-50%	1-20%	-	2-08%
2	-	-	1-06%	1-04%
3	-	-	-	-
4	-	1-20%	-	1-04%
5	1-50%	-	2-11%	3-12%
6	-	1-20%	1-06%	2-08%
7	-	-	3-17%	3-12%
8	-	-	6-33%	6-24%
9	-	-	3-17%	3-12%
10	-	2-40%	2-11%	4-16%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	1-25%	-	1-04%
2	-	-	1-06%	1-04%
3	-	-	1-06%	1-04%
4	-	-	-	-
5	1-50%	-	1-06%	2-09%
6	-	2-50%	2-12%	4-17%
7	-	-	4-24%	4-17%
8	1-50%	-	5-29%	6-26%
9	-	-	2-12%	2-09%
10	-	1-25%	1-06%	2-09%

Table 10 - Rating of Extension Computing Service
(cont)

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	1-50%	1-25%	1-06%	3-13%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	1-06%	1-04%
6	1-50%	-	4-24%	5-22%
7	-	-	1-06%	1-04%
8	-	-	5-29%	5-22%
9	-	1-25%	3-18%	4-17%
10	-	2-50%	2-12%	4-17%
RELIABILITY				
1	-	1-25%	-	1-05%
2	1-50%	-	-	1-05%
3	-	-	2-13%	2-10%
4	-	-	-	-
5	-	-	3-20%	3-14%
6	-	-	1-07%	1-05%
7	-	1-25%	2-13%	3-14%
8	-	-	4-27%	4-19%
9	1-50%	-	2-13%	3-14%
10	-	2-50%	1-07%	3-14%

Table 11 - Rating of Commercial Computing Services

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	1-20%	-	-	1-05%
4	-	-	-	-
5	1-20%	-	2-18%	3-16%
6	-	1-33%	-	1-05%
7	-	-	1-09%	1-05%
8	-	-	-	-
9	2-40%	-	5-46%	7-37%
10	1-20%	2-67%	3-27%	6-32%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	-	1-33%	2-18%	3-16%
4	-	-	-	-
5	1-20%	-	1-09%	2-10%
6	-	-	-	-
7	1-20%	-	-	1-05%
8	1-20%	-	3-27%	4-21%
9	1-20%	1-33%	2-18%	4-21%
10	1-20%	1-33%	3-27%	5-26%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	-	1-09%	1-05%
2	-	-	-	-
3	-	-	1-09%	1-05%
4	-	-	-	-
5	-	1-33%	1-09%	2-10%
6	2-40%	-	-	2-10%
7	-	-	2-18%	2-10%
8	2-40%	1-33%	2-18%	5-26%
9	-	-	2-18%	2-10%
10	1-20%	1-33%	2-18%	4-21%

Table 11 - Rating of Commercial Computing Services
(cont)

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	1-20%	-	-	1-05%
2	-	-	2-18%	2-10%
3	-	-	1-09%	1-05%
4	-	-	-	-
5	1-20%	-	-	1-05%
6	-	-	-	-
7	-	1-33%	-	1-05%
8	-	-	2-18%	2-10%
9	1-20%	-	4-36%	5-26%
10	2-40%	2-67%	2-18%	6-32%
RELIABILITY				
1	1-25%	-	1-10%	2-12%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	1-10%	1-06%
6	-	-	1-10%	1-06%
7	-	-	-	-
8	1-25%	1-33%	-	2-12%
9	2-50%	-	5-50%	7-41%
10	-	2-67%	2-20%	4-24%

Table 12 - Rating of Other Computer Services

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	1-50%	1-33%
10	-	1-100	1-50%	2-67%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	1-50%	1-33%
9	-	-	-	-
10	-	1-100	1-50%	2-67%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	1-50%	1-33%
8	-	1-100	-	1-33%
9	-	-	-	-
10	-	-	-	-

Table 12 - Rating of Other Computing Services
(cont)

<u>RATING</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	1-50%	1-33%
10	-	1-100	1-50%	2-67%
RELIABILITY				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	-	1-50%	1-33%
10	-	1-100	1-50%	2-67%

Table 13 - Previous Uses of Computing Tools

<u>USE</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Financial Record Keeping	6-86%	10-63%	16-57%	32-63%
Production Record Keeping	6-86%	8-50%	13-46%	27-53%
Ration Formulation	1-14%	8-50%	9-32%	18-35%
Break Even Analysis	4-57%	12-75%	13-46%	29-57%
Market Analysis	-	3-18%	2-07%	5-10%
Estate Planning	1-14%	2-12%	6-21%	9-18%

Table 14 - Response to Home Computer Purchase

<u>RESPONSE</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Yes	5-56%	6-35%	27-55%	38-51%
No	2-22%	-	19-39%	21-28%
Already Have One	2-22%	10-59%	-	12-16%
Don't Know	-	1-06%	2-04%	3-04%
No Response	-	-	1-02%	1-01%

Table 15 - Estimated Purchase Time

<u>TIME</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
This Year	-	1-20%	-	1-03%
1 - 2 Years	3-60%	3-60%	4-15%	10-27%
3 - 4 Years	1-20%	1-20%	9-33%	11-30%
Over 5 Years	1-20%	-	14-52%	15-40%

Table 16 - Functions Desired

<u>FUNCTIONS</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Financial Record Keeping	7-78%	15-88%	41-84%	63-84%
Depreciation Scheduling	2-22%	13-76%	33-67%	48-64%
Balance, Income, Cash Flow Stmts	8-89%	13-76%	36-74%	57-76%
Payroll Calculation	4-44%	6-35%	6-12%	16-21%
Income Tax Preparation	4-44%	8-47%	21-43%	33-44%
Budget Preparation	7-78%	11-65%	20-41%	38-51%
Anal of Proj vs Actual Budgets	6-67%	13-76%	21-43%	40-53%
Crop Production Record Keeping	7-78%	12-71%	28-57%	47-63%
Livestock Prod Record Keeping	2-23%	13-76%	31-63%	46-61%
Break Even Anal of Enterprises	6-67%	15-88%	30-61%	51-68%

Table 16 - Functions Desired
(cont)

<u>FUNCTIONS</u>	<u>RAND</u>	<u>INQR</u>	<u>FRAT</u>	<u>TOTL</u>
Least Cost Ration Formulation	-	13-76%	28-57%	41-55%
Nutrient Anal of Rations	-	8-47%	25-51%	33-44%
Calc Chem & Fert Application Rates	2-22%	7-41%	18-37%	27-36%
Calc Planting Rates	2-22%	3-18%	10-20%	15-20%
Commodity Price Record Keeping	5-56%	7-41%	20-41%	32-43%
Calc Grain Storage Costs	3-33%	6-35%	8-16%	17-23%
Harvest RecordS (Net, Moist, Etc)	6-67%	5-29%	22-45%	33-44%
Calc Various Wts & Meas	3-33%	3-18%	11-22%	17-23%
Periodic Summary Reports of Prod	6-67%	9-53%	25-51%	40-53%

Appendix C

Frequencies by Question and Purchase Response Group

List of Tables

1	Crop and Livestock Production	C- 3
2	Number of Acres Managed	C- 4
3	Percent of Land Tillable.	C- 5
4	Percent of Land Irrigated	C- 6
5	Education Received.	C- 7
6	Ranking of Use Factors.	C- 8
7	Use of Computing Tools.	C- 9
8	Rating of Programmable Calculators.	C-10
9	Rating of Home Computers.	C-12
10	Rating Of Extension Computing Service	C-14
11	Rating of Commercial Computing Services	C-16
12	Rating of Other Computer Services	C-18
13	Previous Uses of Computing Tools.	C-20
14	Estimated Purchase Time	C-21
15	Functions Desired	C-22

Table 1 - Crop and Livestock Production

<u>COMMODITY</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Wheat	11-92%	35-92%	21-100%	67-94%
Corn	9-75%	17-45%	3-14%	29-41%
Milo	8-67%	30-79%	15-71%	53-75%
Soybeans	1-08%	8-21%	1-14%	12-17%
Hay	9-75%	27-71%	19-90%	55-78%
Cow - Calf	4-33%	22-58%	14-67%	40-56%
Feeders	5-42%	19-50%	8-38%	32-45%
Finish Cattle	3-25%	9-24%	1-05%	13-18%
Farrow Hogs	-	12-32%	7-33%	19-27%
Finish Hogs	-	10-26%	7-33%	17-24%
Dairy Cows	1-08%	4-10%	2-10%	7-10%
Sheep	1-08%	4-10%	3-14%	8-11%

Table 2 - Number of Acres Managed

<u>ACRES</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Upto 500	2-17%	3-08%	5-24%	10-14%
Over 500	2-17%	6-16%	4-19%	12-17%
Over 1000	1-08%	14-37%	8-38%	23-32%
Over 2000	4-33%	9-24%	3-14%	16-23%
Over 4000	3-25%	6-16%	1-05%	10-14%

Table 3 - Percent of Land Tillable

<u>PERCENT TILLABLE</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
1 - 20%	1-08%	4-10%	2-10%	7-10%
21 - 40%	2-17%	1-03%	5-24%	8-11%
41 - 60%	3-25%	9-24%	7-33%	19-27%
61 - 80%	-	11-29%	3-14%	14-20%
81 - 99%	2-17%	9-24%	3-14%	14-20%
100%	4-33%	4-10%	1-05%	9-13%

Table 4 - Percent of Land Irrigated

<u>PERCENT IRRIGATED</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
0%	5-42%	22-58%	19-90%	46-65%
1 - 20%	2-17%	5-13%	-	7-10%
21 - 40%	1-08%	4-10%	-	5-07%
41 - 60%	2-17%	1-03%	-	2-03%
61 - 80%	1-08%	1-03%	1-05%	3-04%
81 - 99%	-	6-16%	-	6-08%
100%	1-08%	-	1-05%	2-03%

Table 5 - Education Received

<u>SUBJECT</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Record Keeping	7-58%	34-90%	10-48%	51-72%
Enterprise Analysis	3-25%	20-53%	6-29%	29-41%
Tax Planning	4-33%	19-50%	10-48%	33-46%
Estate Planning	3-25%	24-63%	11-52%	38-54%
Computer Programming	6-50%	13-34%	10-48%	29-41%
Programmable Calculators	1-08%	8-21%	2-10%	11-15%
Marketing	7-58%	31-82%	12-57%	50-71%

Table 6 - Ranking of Use Factors

<u>RANK</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
PRIVACY				
First	1-10%	4-11%	-	5-07%
Second	1-10%	1-03%	2-10%	4-06%
Third	2-20%	8-22%	4-21%	14-20%
Fourth	5-50%	21-56%	13-68%	39-55%
COST				
First	-	15-42%	9-45%	24-34%
Second	4-40%	7-19%	5-25%	16-22%
Third	4-40%	9-25%	5-25%	18-25%
Fourth	2-20%	5-14%	1-05%	8-11%
AVAILABILITY OF SOFTWARE				
First	3-30%	10-28%	5-26%	18-25%
Second	2-20%	11-31%	6-32%	19-27%
Third	1-10%	8-22%	6-32%	15-21%
Fourth	1-10%	7-19%	2-11%	10-14%
SIMPLICITY OF USE				
First	3-30%	9-25%	6-30%	18-25%
Second	3-30%	18-50%	7-35%	28-39%
Third	3-30%	8-22%	5-25%	16-22%
Fourth	1-10%	1-03%	2-10%	4-06%

Table 7 - Use of Computing Tools

<u>TOOLS USED</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Programmable Calculator	6-50%	10-26%	3-14%	19-27%
Home Computer	12-100	3-08%	-	15-21%
Extension	4-33%	14-37%	6-27%	24-34%
Commercial	3-25%	14-37%	2-10%	19-27%
Other	1-08%	2-05%	-	3-04%

Table 8 - Rating of Programmable Calculators

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	1-20%	-	-	1-06%
2	-	-	-	-
3	-	-	-	-
4	-	-	1-33%	1-06%
5	-	1-10%	-	1-06%
6	-	-	-	-
7	1-20%	1-10%	1-33%	3-17%
8	1-20%	4-40%	-	5-28%
9	1-20%	1-10%	-	2-11%
10	1-20%	3-30%	1-33%	5-28%
ADEQUACY OF EXPECTED PERFORMANCE				
1	1-17%	-	-	1-05%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	2-33%	1-10%	-	3-16%
6	-	1-10%	-	1-05%
7	-	-	-	-
8	1-17%	1-10%	2-67%	4-21%
9	-	4-40%	-	4-21%
10	2-33%	3-30%	1-33%	6-32%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	1-17%	-	-	1-05%
2	-	-	-	-
3	-	-	-	-
4	-	2-20%	-	2-10%
5	1-17%	2-20%	-	3-16%
6	1-17%	-	-	1-05%
7	-	2-20%	-	2-10%
8	-	2-20%	2-67%	4-21%
9	2-33%	2-20%	1-33%	4-21%
10	1-17%	-	-	2-10%

Table 8 - Rating of Programmable Calculators
(cont)

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	1-17%	-	-	1-05%
2	1-17%	-	-	1-05%
3	-	-	-	-
4	-	-	-	-
5	-	1-10%	-	1-05%
6	-	-	-	-
7	1-17%	-	1-33%	2-10%
8	-	4-40%	-	4-21%
9	-	9-10%	1-33%	2-10%
10	3-50%	4-40%	1-33%	8-42%
RELIABILITY				
1	1-17%	-	-	1-05%
2	-	-	-	-
3	1-17%	-	-	1-05%
4	-	-	-	-
5	-	2-20%	-	2-10%
6	-	-	1-33%	1-05%
7	1-17%	-	1-33%	2-10%
8	-	5-50%	1-33%	6-32%
9	-	1-10%	-	1-05%
10	3-50%	2-20%	-	5-26%

Table 9 - Rating of Home Computers

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	1-50%	-	1-10%
5	-	-	-	-
6	-	-	-	-
7	1-12%	-	-	1-10%
8	1-12%	-	-	1-10%
9	3-38%	1-50%	-	4-40%
10	3-38%	-	-	3-30%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	-	1-50%	-	1-08%
4	-	-	-	-
5	2-18%	-	-	2-15%
6	1-09%	-	-	1-08%
7	1-09%	-	-	1-08%
8	2-18%	-	-	2-15%
9	2-18%	-	-	2-15%
10	3-27%	1-50%	-	4-31%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	-	-	-
2	-	-	-	-
3	1-09%	-	-	1-08%
4	1-09%	1-33%	-	2-15%
5	-	-	-	-
6	2-18%	1-33%	-	3-22%
7	2-18%	-	-	2-15%
8	3-27%	-	-	3-22%
9	1-09%	-	1-08%	-
10	1-09%	-	-	1-08%

Table 9 - Rating of Home Computers
(cont)

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	1-09%	-	-	1-08%
6	-	-	-	-
7	1-09%	-	-	1-08%
8	1-09%	-	-	1-08%
9	1-09%	1-50%	-	2-15%
10	7-64%	1-50%	-	8-62%
RELIABILITY				
1	-	-	-	-
2	-	-	-	-
3	1-09%	1-50%	-	2-15%
4	1-09%	-	-	1-08%
5	1-09%	-	-	1-08%
6	-	-	-	-
7	-	-	-	-
8	4-36%	1-50%	-	5-38%
9	3-27%	-	-	3-23%
10	1-09%	-	-	1-08%

Table 10 - Rating of Extension Computing Service

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	1-25%	2-17%	-	3-14%
6	-	1-08%	-	1-05%
7	1-25%	1-08%	1-20%	3-14%
8	1-25%	5-42%	1-20%	7-33%
9	-	1-08%	3-60%	4-19%
10	1-25%	2-17%	-	3-14%
ADEQUACY OF EXPECTED PERFORMANCE				
1	1-25%	-	-	1-04%
2	-	-	-	-
3	-	-	-	-
4	-	1-07%	-	1-04%
5	1-25%	2-14%	-	3-13%
6	1-25%	1-07%	-	2-09%
7	-	1-07%	2-40%	3-13%
8	-	5-36%	1-20%	6-26%
9	-	2-14%	1-20%	3-13%
10	1-25%	2-14%	1-20%	4-17%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	-	-	-
2	-	-	-	-
3	-	1-08%	-	1-05%
4	-	-	-	-
5	1-25%	-	1-25%	2-10%
6	1-25%	3-23%	-	4-19%
7	-	4-31%	-	4-19%
8	1-25%	3-23%	2-50%	6-29%
9	-	1-08%	1-25%	2-10%
10	1-25%	1-08%	-	2-10%

Table 10 - Rating of Extension Computing Service
(cont)

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	1-25%	1-08%	-	2-09%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	1-20%	1-04%
6	1-25%	4-31%	-	5-23%
7	-	1-08%	-	1-04%
8	-	4-31%	1-20%	5-23%
9	1-25%	1-08%	2-40%	4-18%
10	1-25%	2-15%	1-20%	4-18%
RELIABILITY				
1	-	-	-	-
2	1-25%	-	-	1-05%
3	-	2-17%	-	2-10%
4	-	-	-	-
5	-	2-17%	1-25%	3-15%
6	-	1-08%	-	1-05%
7	1-25%	2-17%	-	3-15%
8	-	2-17%	2-50%	4-20%
9	1-25%	1-08%	1-25%	3-15%
10	1-25%	2-17%	-	3-15%

Table 11 - Rating of Commercial Computing Services

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	1-07%	-	1-05%
4	-	-	-	-
5	-	2-14%	1-50%	3-16%
6	1-33%	-	-	1-05%
7	-	1-07%	-	1-05%
8	-	-	-	-
9	-	6-43%	1-50%	7-37%
10	2-67%	4-29%	-	6-32%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	1-33%	2-14%	-	3-16%
4	-	-	-	-
5	-	2-14%	-	2-10%
6	-	-	-	-
7	-	-	1-50%	1-05%
8	-	4-29%	-	4-21%
9	1-33%	2-14%	1-50%	4-21%
10	1-33%	4-29%	-	5-26%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	1-08%	-	1-05%
2	-	-	-	-
3	-	1-08%	-	1-05%
4	-	-	-	-
5	1-33%	1-08%	-	2-10%
6	-	2-14%	-	2-10%
7	-	2-14%	-	2-10%
8	1-33%	2-14%	2-100	5-26%
9	-	2-14%	-	2-10%
10	1-33%	3-21%	-	4-21%

Table 11 - Rating of Commercial Computing Services
(cont)

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	1-08%	-	1-05%
2	-	2-14%	-	2-10%
3	-	1-08%	-	1-05%
4	-	-	-	-
5	-	-	1-50%	1-05%
6	-	-	-	-
7	1-33%	-	-	1-05%
8	-	1-08%	1-50%	2-10%
9	-	5-36%	-	5-26%
10	2-67%	4-29%	-	6-32%
RELIABILITY				
1	-	2-17%	-	2-12%
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	1-08%	-	1-06%
6	-	1-08%	-	1-06%
7	-	-	-	-
8	1-33%	-	1-50%	2-12%
9	-	6-50%	1-50%	7-41%
10	2-67%	2-17%	-	4-24%

Table 12 - Rating of Other Computer Services

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
CONFIDENCE IN RESULTS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	1-50%	-	1-33%
10	1-100	1-50%	-	2-67%
ADEQUACY OF EXPECTED PERFORMANCE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	1-50%	-	1-33%
9	-	-	-	-
10	1-100	1-50%	-	2-67%
UNDERSTANDABILITY OF INSTRUCTIONS				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	1-50%	-	1-33%
8	1-100	-	-	1-33%
9	-	-	-	-
10	-	1-50%	1-33%	-

Table 12 - Rating of Other Computing Services
(cont)

<u>RATING</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
DESIRE TO REPEAT USE				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	1-50%	-	1-33%
10	1-100	1-50%	-	2-66%
RELIABILITY				
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	-
7	-	-	-	-
8	-	-	-	-
9	-	1-50% -	1-33%	-
10	1-100	1-50%	-	2-67%

Table 13 - Previous Uses of Computing Tools

<u>USE</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Financial Record Keeping	10-83%	15-58%	4-40%	29-60%
Production Record Keeping	7-58%	13-50%	6-60%	26-54%
Ration Formulation	5-42%	9-35%	4-40%	18-38%
Break Even Analysis	8-67%	15-58%	5-50%	28-58%
Market Analysis	2-17%	2-08%	1-10%	5-10%
Estate Planning	1-08%	5-19%	3-30%	9-19%

Table 14 - Estimated Purchase Time

<u>TIME</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
This Year	-	1-03%	-	1-03%
1 - 2 Years	-	10-27%	-	10-27%
3 - 4 Years	-	11-30%	-	11-30%
Over 5 Years	-	15-40%	-	15-40%

Table 15 - Functions Desired

<u>FUNCTIONS</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Financial Record Keeping	10-83%	37-97%	13-72%	60-84%
Depreciation Scheduling	9-75%	25-67%	11-61%	45-63%
Balance, Income, Cash Flow Stmts	8-67%	34-90%	12-67%	54-76%
Payroll Calculation	7-58%	7-18%	1-06%	15-21%
Income Tax Preparation	5-42%	15-40%	11-61%	31-44%
Budget Preparation	7-58%	25-66%	4-22%	36-51%
Anal of Proj vs Actual Budgets	10-83%	23-60%	5-28%	38-54%
Crop Production Record Keeping	10-83%	27-71%	7-39%	44-62%
Livestock Prod Record Keeping	7-58%	26-68%	10-56%	43-61%
Break Even Anal of Enterprises	10-83%	29-76%	10-56%	49-69%

Table 15 - Functions Desired
(cont)

<u>FUNCTIONS</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>	<u>TOTL</u>
Least Cost Ration Formulation	8-67%	21-55%	10-56%	39-55%
Nutrient Anal of Rations	5-46%	18-47%	8-44%	31-44%
Calc Chem & Fert Application Rates	6-50%	14-37%	6-33%	26-36%
Calc Planting Rates	3-25%	10-26%	2-11%	15-21%
Commodity Price Record Keeping	5-46%	22-58%	4-22%	31-44%
Calc Grain Storage Costs	4-33%	10-26%	2-11%	16-22%
Harvest Records (Net, Moist, Etc)	5-42%	22-58%	3-17%	30-42%
Calc Various Wts & Meas	3-25%	10-26%	3-17%	16-22%
Periodic Summary Reports of Prod	8-67%	22-58%	7-39%	37-52%

Appendix D

Desired Functions Ranked by Preference

Table 1 - Functions Desired by Farmers
Ranked in Descending Order
of Preference

<u>FUNCTION</u>	<u>USER</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>
Financial Record Keeping	47-94%	10-83%	37-97%	13-72%
Balance Sheet, Income, Cash Flow Statements	42-84%	8-67%	34-90%	12-67%
Break Even Analysis of Individual Enterprises	39-78%	10-83%	29-76%	10-56%
Crop Production Records by Fields	37-74%	10-83%	27-71%	7-39%
Depreciation Scheduling	34-68%	9-75%	25-67%	11-61%
Analysis of Proj. Budgets vs. Actual Expenditures	33-66%	10-83%	23-60%	5-28%
Livestock Production Records	33-66%	7-58%	26-58%	10-56%
Budget Preparation	32-64%	7-58%	25-66%	4-22%
Periodic Summary Reports of Production	30-60%	8-67%	22-58%	7-39%
Least Cost Ration Formulation	29-58%	8-67%	21-55%	10-56%
Maintaining Records of Commodity Prices	27-54%	5-42%	22-58%	4-22%
Harvest Records (lbs., bu., moisture, rent share, etc.)	27-54%	5-42%	22-58%	3-17%

Table 1 - Functions Desired by Farmers
(cont)

<u>FUNCTION</u>	<u>USER</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>
Nutrient Analysis of Rations	23-46%	5-42%	18-47%	8-44%
Income Tax Preparation	20-40%	5-42%	15-40%	11-61%
Calculation of Chemical and Fertilizer Application Rates	20-40%	6-50%	14-37%	6-33%
Payroll	14-28%	7-58%	7-18%	1-16%
Calculation of Grain Storage Costs	14-28%	4-33%	10-26%	2-11%
Calculation of Planting Rates	13-26%	3-25%	10-26%	2-11%
Calc. of Various Weights Measures, Conv. to Metric	13-26%	3-25%	10-26%	3-17%

Table 2 - Functions Requested by Farmers

<u>Function</u>	<u>USER</u>	<u>OWNER</u>	<u>YES</u>	<u>NO</u>
Equipment Maintance Records	5-10%	3-25%	2-05%	-
Market Analysis, Charting of Prices	5-10%	1-08%	4-10%	-
Records of Personal Futures Trading Activity	4-08%	1-08%	3-08%	-
Calendar - Diary, Future Events	3-06%	-	3-08%	-
Feedlot Records, Livestock Location	2-04%	2-05%	-	-
Automatic Weather Records	2-04%	2-17%	-	-
Irrigation Pump Monitoring	2-04%	2-17%	-	-
Evaluation of Farmers Marketing Performance	2-04%	-	2-05%	-
Livestock Lineage Records	1-02%	-	1-03%	-
Family Living Expense Records	1-02%	-	-	1-05%
Lease-Buy-Custom Hire of Machinery Analysis	1-02%	1-08%	-	-
Performance Rating of A Cow Herd	1-02%	-	-	1-05%
Inventory of Parts, Feed and Seed	1-02%	-	1-03%	-

* Note These functions appeared as comments
by the respondents.

POTENTIAL USE OF MICROCOMPUTERS
IN FARM MANAGEMENT

by

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ABSTRACT

Farmers, like many other businessmen, are beginning to realize the potential benefits of computers. The development of relatively inexpensive microcomputer systems has brought the world of computing to the fingertips of today's farm manager. Many farmers have purchased home (micro) computers only to find the necessary software virtually non-existent.

In view of this fact a survey of Kansas farmers was proposed to meet the following objectives.

- 1) Determine the computing tools farmers have used, their rating of those tools, and the functions performed.
- 2) Establish the factors farmers regard as most important when considering the use of a computer.
- 3) Determine what plans, if any, farmers have for purchasing a home computer.
- 4) Define those functions farmers want a home computer to provide.

A profile of the potential home computer user is developed based on information from the previously defined objectives and from questions regarding farm size and type, and instruction received in various subjects. Those functions desired by farmers are ranked in order of preference. Feasibility of implementation is discussed in terms of potential use.